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THE UNITED STATES OF AMERICA

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United States Patent and Trademark Office

November 03, 2003

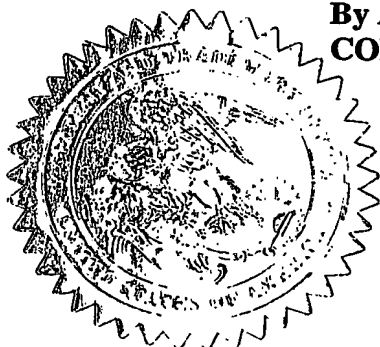
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APPLICATION NUMBER: 60/414,606

FILING DATE: September 27, 2002

RELATED PCT APPLICATION NUMBER: PCT/US03/30453

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS



N. Woodson
N. WOODSON
Certifying Officer

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60/414606 . 092702

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09/27/02

11051 U.S. PTO

PMB:mgs 09/27/02 143424
 Attorney's Matter No. 160-64020
 PATENT

EXPRESS MAIL LABEL NO. EV 078794949 US
 DATE OF DEPOSIT: September 27, 2002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BOX PROVISIONAL PATENT APPLICATION
 COMMISSIONER FOR PATENTS
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24197

11040 U.S. PTO
 60/414606

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 C.F.R. § 1.53(c).

TITLE: INTEGRATED ROOF RACK ANTENNA

Inventor(s)/Applicant(s):

Tornatta, Jr.	Paul	A.	Vancouver, Washington
Last	First	MI	City, State or Foreign Country and City
Grant	Gary	W.	Oregon City, Oregon
Last	First	MI	City, State or Foreign Country and City
Young	Jonathan		Vancouver, Washington
Last	First	MI	City, State or Foreign Country and City

- ☒ 26 pages of specification are enclosed.
- ☒ Provisional Filing Fee Amount:
☒ \$160, large entity
- ☒ A check in the amount of \$160.00 to cover the filing fee is enclosed.
- ☒ The Director is hereby authorized to charge any additional fees which may be required in connection with the filing of this provisional application filed herewith, or credit overpayment, to Account No. 02-4550. A copy of this sheet is enclosed.
- ☒ Please return the enclosed postcard to confirm that the items listed above have been received.
- ☒ Address all telephone calls to Patrick M. Bible at telephone number (503) 226-7391.

60414606-092702

PMB:mgs 09/27/02 143424
Attorney's Matter No. 160-64020
PATENT

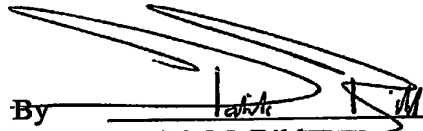
EXPRESS MAIL LABEL NO. EV 078794949 US
DATE OF DEPOSIT: September 27, 2002

☒ Address all correspondence to:

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One World Trade Center, Suite 1600
121 S.W. Salmon Street
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Respectfully submitted,

KLARQUIST SPARKMAN, LLP

By 
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cc: Docketing

Tornatta et al.
Title: INTEGRATED ROOF RACK ANTENNA
Express Mail: EV 078794949 US
Mailed: September 27, 2002
*Attorney Matter No. 160-64020

1

Automotive Accessory Product with Integrated Communications Antenna Technology



60714606.092702

Concept

- Automotive accessory - in this case a roof mounted rack intended for carrying cargo - with embedded advanced communications antennas
- Communications bands include, but are not limited to - AMPS, PCS, GPS, SDARS, DAB, GSM, ISM, AM/FM, TV



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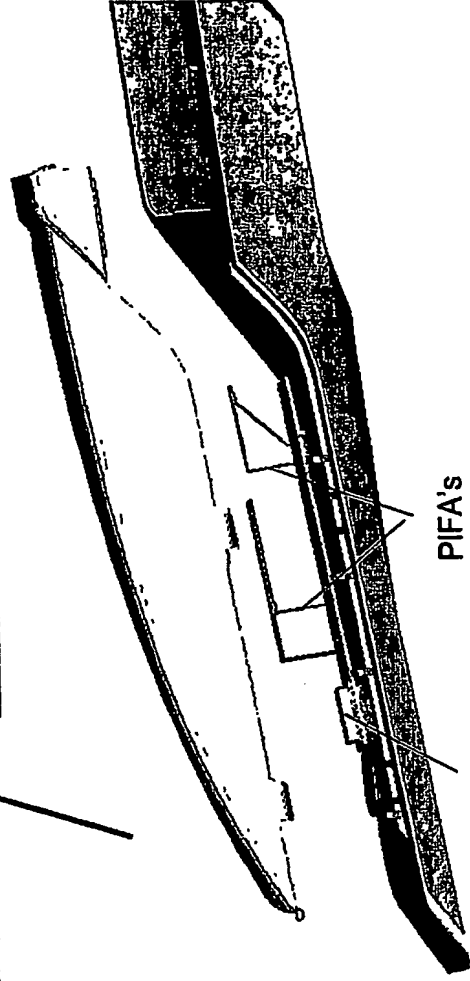
Telematics Implementation Integrated Roof Rack

FEATURES / BENEFITS

- Tri-band performance: AMPS/PCS/GPS
- Improved Aesthetics: completely hidden antenna
- Improved Reliability / Warranty: antenna protected by rack cover -very robust mechanical integration
- Reduce vandalism
- Reduce APEI

APPLICATIONS:

- Personal Calling
- Navigation
- Stolen Vehicle Recovery
- Remote Diagnostics
- Location Commerce



PIFA's

GPS Module



RAD
Radial Automotive Division

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4

Antenna Gain Study – Integrated Roof Rack Antenna



Radiall / SportRack Proprietary Information



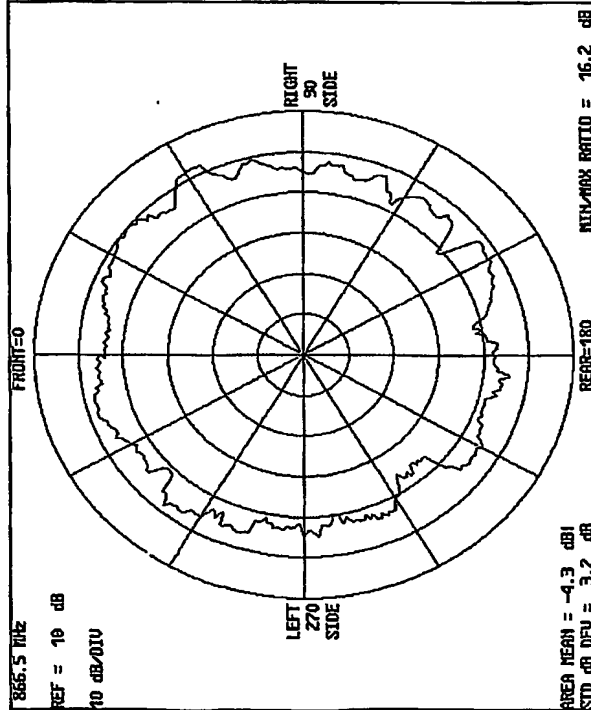
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AMPS Performance with Luggage Carrier - 2003 Trailblazer 5

- OnStar gain specification is -3 dBi in AMPS
- 2 of 14 frequencies tested demonstrate compliant performance
- 8 of 14 frequencies demonstrate marginal performance
- Mean Gain is -4.0 dBi within band

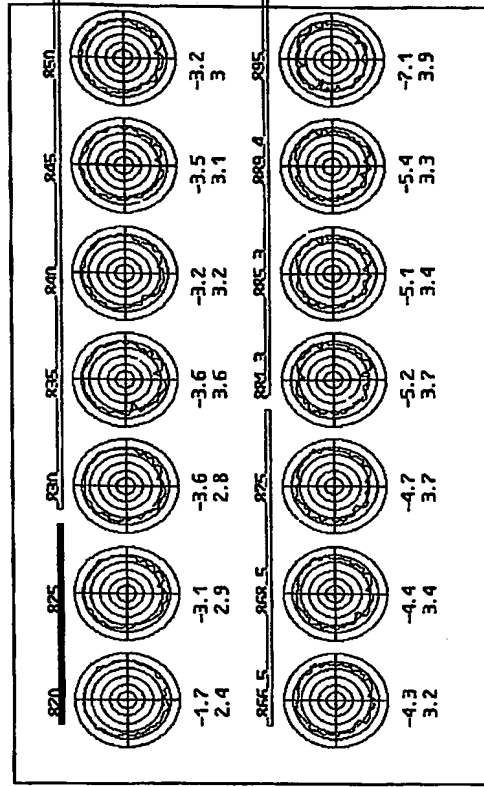
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Pattern.....1
Frequency.....850 Mhz Span.....100 Mhz
UNIT TESTED.....B3 CHEVROLET
Mfg./Model.....TRAIL BLAZER
ID Number.....
Antenna Type.....TRI-BAND 1195
Antenna Location.....PASSENGER SIDE ROOF
WITH LUGGAGE CARRIER
RF DETECTOR.....SPECTRUM ANALYZER
Mfg./Model.....Anritsu MS2652A
Resolution BW.....100 KHz
Detector Function.....Peak
RF SOURCE.....LAB SIGNAL
Mfg./Model.....Anritsu MH688H1
Modulation.....NONE
RF Level.....0 dBm
Transmit Antenna.....JRP 50-1000 Mhz NLP
Polarization.....VERTICAL
Range.....150 Ft.
Press any key to continue.



Radial / SportRack Proprietary Information



Radial Automotive Division



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PCS Performance with Luggage Carrier - 2003 Trailblazer 6

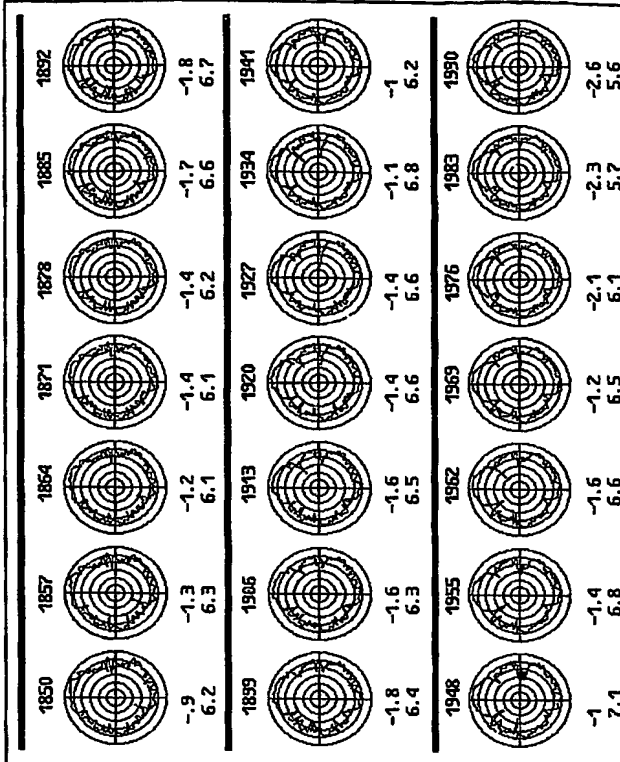
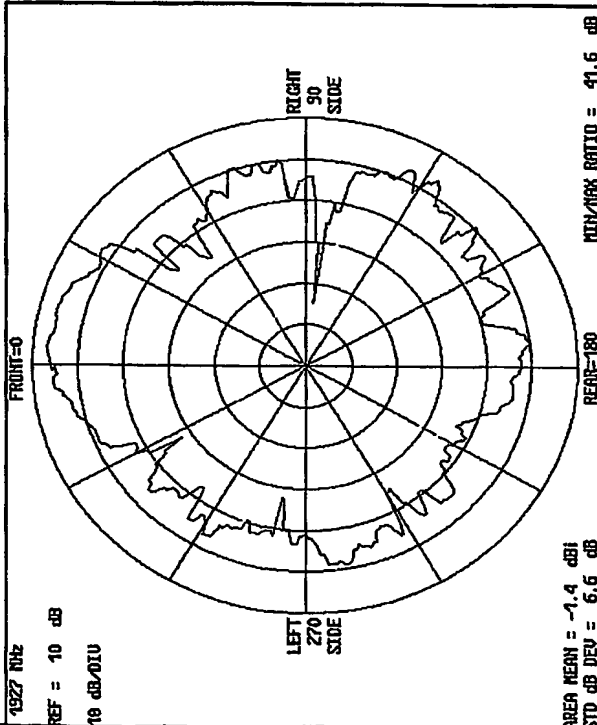
- OnStar gain specification is -3 dBi in PCS
- 21 of 21 frequencies tested demonstrate compliant performance
- 0 of 21 frequencies demonstrate marginal performance
- Mean Gain is -1.5 dBi within band



88-27-2002 DOCUMENTATION 18:58:41

Pattern..... 2
 Frequency..... 1928 MHz Span..... 140 MHz
 UNIT TESTED..... 03 CHEVROLET
 Reg./Model..... TRAIL BLAZER
 ID Number.....
 Antenna Type..... TRI-BAND JRB
 Antenna Location..... PASSENGER SIDE ROOF
 WITH LUGGAGE CARRIER

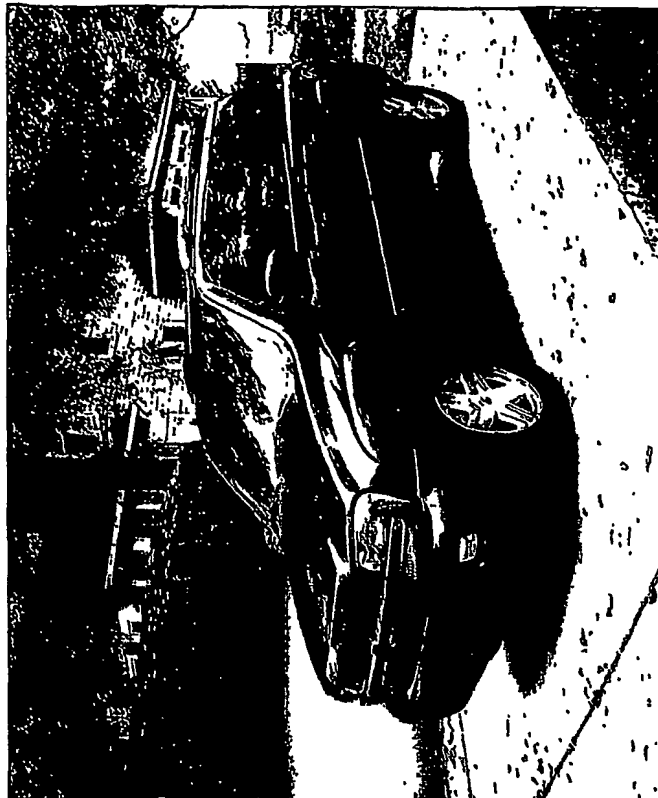
RP DETECTOR..... SPECTRUM ANALYZER
 Reg./Model..... Anritsu MS2681B
 Detector Function..... Peak
 RP SOURCE..... LAB SIGNAL
 Reg./Model..... Anritsu MH6881
 Modulation..... NONE
 RP Level..... -8 dBm
 Transmitt Antenna..... JEP NOL 15CM HORN M1
 Polarization..... VERTICAL
 Height..... 4 Ft.
 Range..... 150 Ft.
 Press any key to continue.



Radiall / SportRack Proprietary Information

AMPS Performance without Luggage Carrier - 2003 Trailblazer

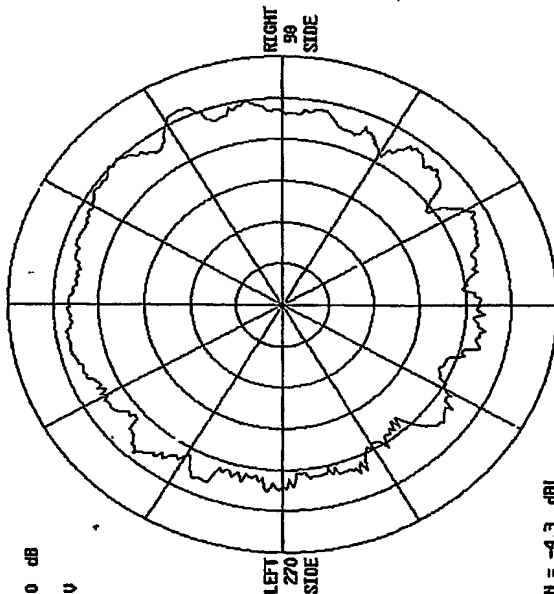
- OnStar gain specification is -3 dBi in AMPS
- 2 of 14 frequencies tested demonstrate compliant performance
- 9 of 14 frequencies demonstrate marginal performance
- Mean Gain is -3.9 dBi within band



88-27-2882 DOCUMENTATION 19:12:12
Pattern..... 4
Frequency..... 850 MHz Span..... 100 MHz
UNIT TESTED..... 03 CHEVROLET
Mfg./Model..... TRAIL BLAZER
ID Number.....
Antenna..... FBI-BAND 1B80
Antenna Location..... PASSENGER SIDE ROOF
LUGGAGE CARRIER REMOVED
RF DETECTOR..... SPECTRUM ANALYZER
Mfg./Model..... Anritsu MS2681A
Resolution BW..... 100 MHz
Detector Function..... Peak
RF SOURCE..... LAB SIGNAL
Mfg./Model..... Anritsu MH68881
Modulation..... NONE
RF Level..... 0 dBm
Transmit Antenna..... JEP 50-1000 MHz KLP
Polarization..... UHPL CAL
Height..... 150 ft.
Press any key to continue:

856.5 MHz FRONT=0

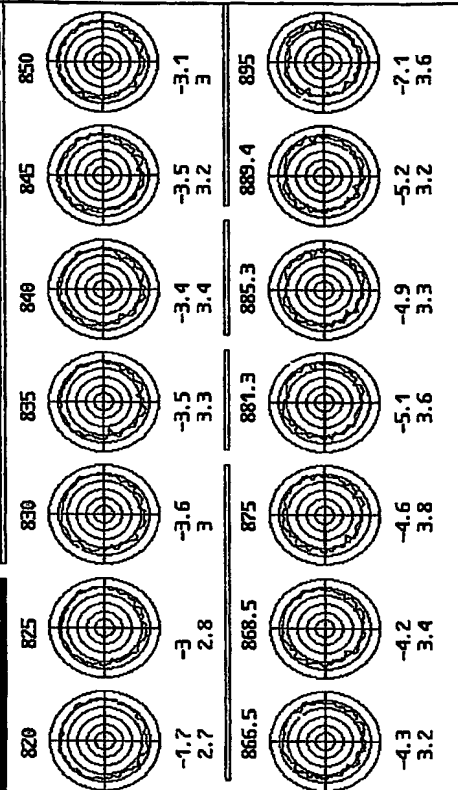
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10 dB/DIV



POWER MEAN = -4.3 dBi
STD DB DEV = 3.2 dB

REAR=180

MIN/MAX RATIO = 15.3 dB



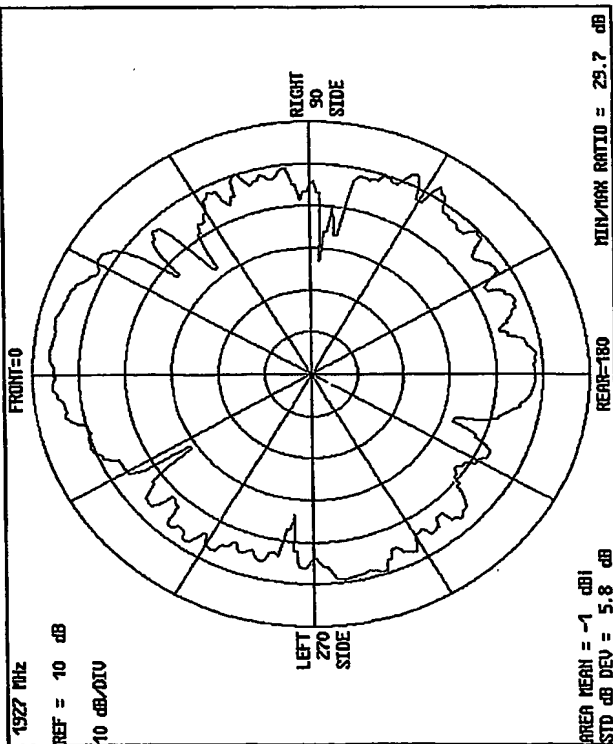
Radiall / SportRack Proprietary Information

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PCS Performance without Luggage Carrier - 2003 Trailblazer

- OnStar gain specification is -3 dBi in PCS
- 21 of 21 frequencies tested demonstrate compliant performance
- 0 of 21 frequencies demonstrate marginal performance
- Mean Gain is -1.3 dBi within band

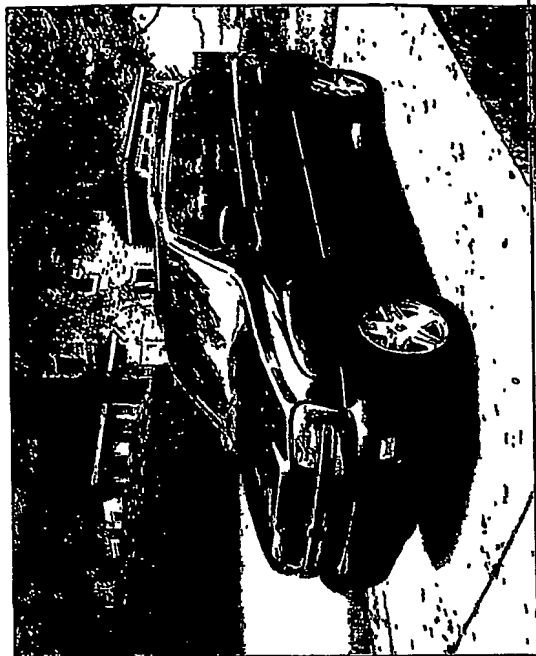
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 Frequency..... 1920 Mhz Span..... 140 Mhz
 UNIT TESTED..... 03 CHEVROLET
 Mfg./Model..... TRAILBLAZER
 ID Number.....
 Antenna Type..... VBI-BAND IRR
 Antenna Location..... PASSENGER SIDE ROOF
 LUGGAGE CARRIER REMOVED
 RP DETECTOR..... SPECTRUM ANALYZER
 Mfg./Model..... Anritsu MS2681A
 Resolution BW..... 100 Mhz
 Detector Function..... Peak
 RP SOURCE..... LAB SIGNAL
 Mfg./Model..... Anritsu MS680A1
 Modulation..... NONE
 RP Level..... 0 dBm
 Transmit Antenna..... JEN NR 15CM HORN 81
 Polarization..... VERTICAL
 Height..... 4 ft.
 Range..... 150 Ft.
 Press any key to continue.



Radiall / SportRack Proprietary Information



Radiall Automotive Division



1859	1857	1854	1871	1878	1885	1892	1899	1906	1913	1920	1927	1934	1941	1948	1955	1962	1969	1976	1983	1990
-9.6	-1.3	-1.2	-1.4	-1.4	-1.6	-1.6	-1.4	-1.3	-1.3	-1.1	-1	-1.7	-8	-7	-1.1	-1.3	-9	-1.7	-1.9	-2.2
6	5.8	5.7	5.9	5.9	5.5	5.5	5.4	5.5	5.8	6	5.8	5.6	5.1	5.5	5.5	5.3	5.5	4.9	4.5	4.5

Comments

- This implementation shows an integrated Telematics antenna. The concept can easily be extended to SDARS (Satellite Radio), AM/FM, TV or any other communications band where the location and size of the roof rack provide adequate performance



60414606.092702

Tomar et al.

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Mailed: September 27, 2002

Attorney Matter No. 160-64020

REV	ECH	DESCRIPTION	BY	DATE
P1				
P2				
P3				
P4				

CRITICAL POINTS

DESCRIPTION/TITLE
Triband Telematics Antenna
Roof Rack Integration

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1		ROOF RACK SIDE RAIL
2	1		ROOF RACK SIDE RAIL FRONT COVER
3	1		ANTENNA

**UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON**

- (1) Decimal Dim 0.0 ±0.1
- (2) Decimal Dim 0.00 ±0.03
- (3) Decimal Dim 0.000 ±0.005

Angular Dim ±2°
Surface Finish √

Release Date	Project Number	Weight (g)

Date	Drawn by	Date	Checkd by
23 SEPT 2002	J YOUNG	23 SEPT 2002	J YOUNG

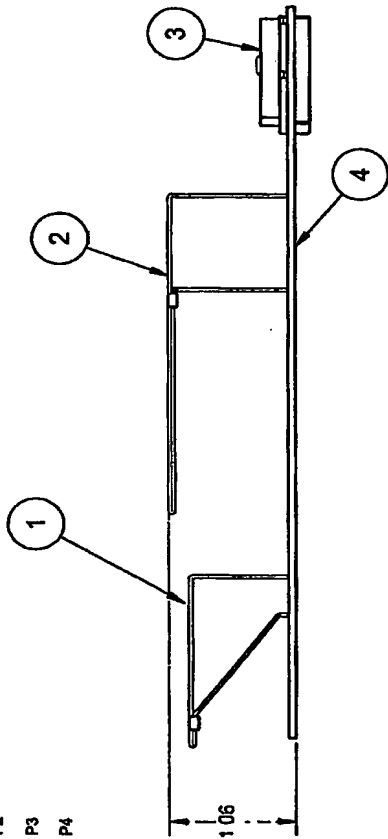
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B Scale 1:2 Sheet # 1/1

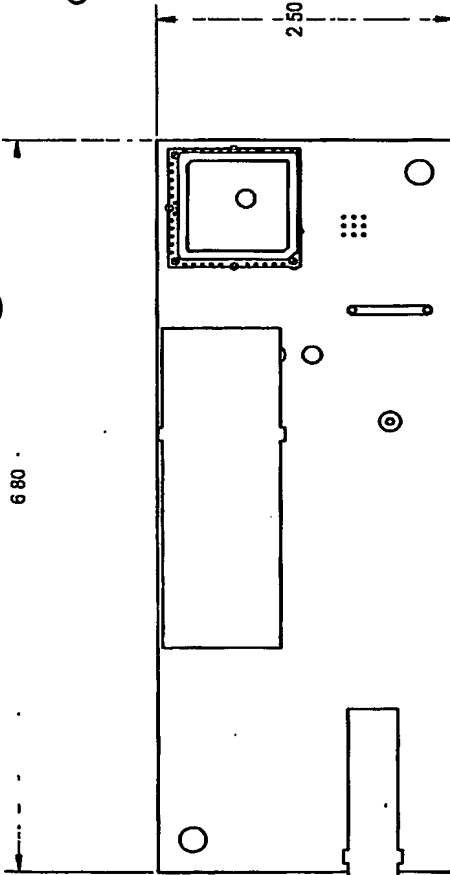
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CRITICAL POINTS		DESCRIPTION/TITLE	PART NUMBER	REV
		TRI-BAND ANTENNA FOR ROOF RACK INTEGRATION		
ITEM	QTY	DESCRIPTION		
1	1	PCS LOOP RADIATOR		
2	1	AMPS PIFA RADIATOR		
3	1	GPS MODULE		
4	1	PRINTED CIRCUIT BOARD		



6 80

COAX CABLES AND CONNECTORS NOT SHOWN



REV	EQNS	DESCRIPTION	BY	DATE	UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES TOLERANCES ON	Release Date	Project Number	Weight (g)
					(1) Decimal Dim (2) Decimal Dim (3) Decimal Dim Angular Dim Surface Finish			

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 VANCOUVER, WA 98662
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 Scale: 1:1
 Sheet 9 of 14

Date: 24 SEPT 2002
 Drawn by: J YOUNG
 Date: 24 SEPT 2002
 Checked by: J YOUNG

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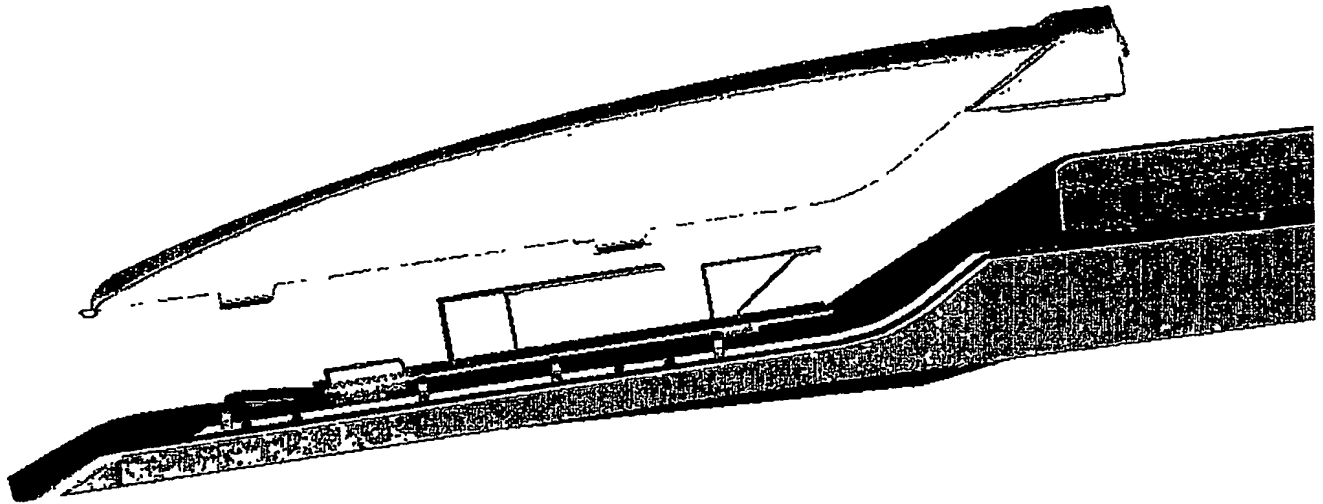
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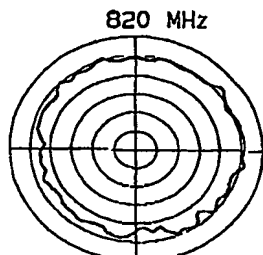
JEF Consultant, Inc.

Belleville, Michigan Phone: (734) 482-5505
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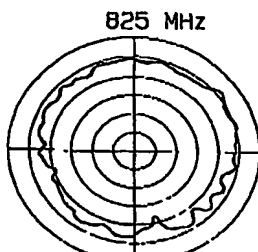
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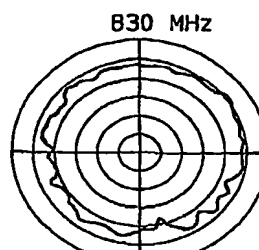
10 dB/DIV



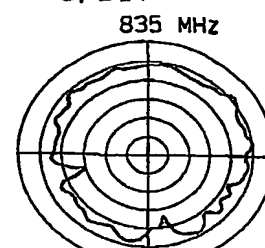
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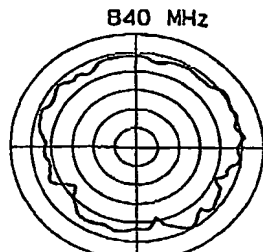
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 M/M Ratio = 15.7



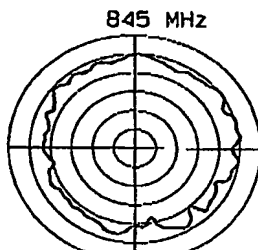
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 Std dB Dev = 2.8
 M/M Ratio = 14.1



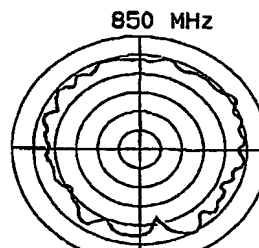
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 Std dB Dev = 3.6
 M/M Ratio = 21.7



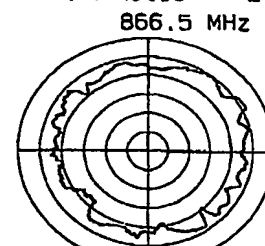
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 M/M Ratio = 15.3



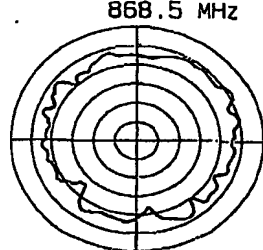
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 M/M Ratio = 13.6



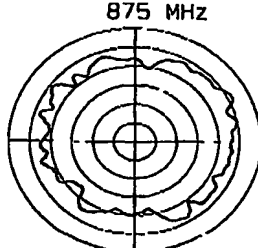
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 Std dB Dev = 3
 M/M Ratio = 15.6



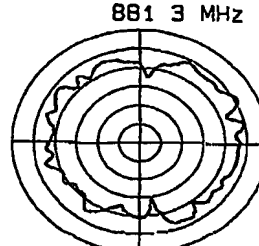
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 M/M Ratio = 16.2



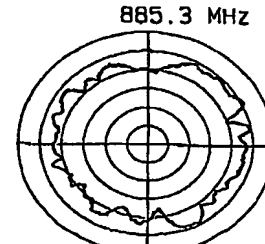
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 Std dB Dev = 3.4
 M/M Ratio = 18.1



Area Mean = -4.7
 Std dB Dev = 3.7
 M/M Ratio = 16.9



Area Mean = -5.2
 Std dB Dev = 3.7
 M/M Ratio = 19.9



Area Mean = -5.1
 Std dB Dev = 3.4
 M/M Ratio = 15.5

Mean of Ind. Area Means... -4 dB1
 Std dB Dev of Area Means... .4 dB

Mean of Ind. MM Ratios.... 17.7 dB
 Std dB Dev of M/M Ratios.. 5.1 dB
 Mean of Ind Std dB Dev's.. 3.3 dB

UNIT TESTED.... '03 CHEVROLET
 Mfg./Model.... TRAIL BLAZER
 Antenna Type... TRI-BAND IRR
 Comments... WITH LUGGAGE CARRIER

ID Number.....
 Ant. Location... PASSENGER SIDE ROOF RACK

RF DETECTOR... SPECTRUM ANALYZER
 Resolution BW.. 100 KHz

Mfg./Model.... Anritsu MS2601A
 Detector Fn... Peak

RF SOURCE... LAB SIGNAL
 Transmit Ant... JEF 50-1000 MHz XLP
 Height..... 10 Ft.

Mfg./Model.... Anritsu MH680A1
 Polarization... VERTICAL
 Range..... 150 Ft.

Tornatta et al.
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Belleville, Michigan

Phone: (734) 482-5505

DATE... 08-27-2002

TIME.....18: 52: 37

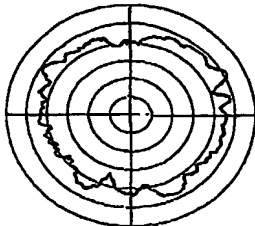
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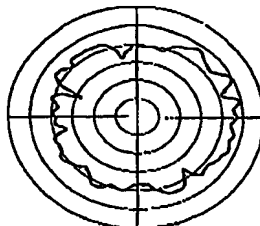
10 dB/DIV

889.4 MHz



Area Mean = -5.4
Std dB Dev = 3.3
M/M Ratio = 18

895 MHz



Area Mean = -7.1
Std dB Dev = 3.9
M/M Ratio = 22

Mean of Ind. Area Means...-4 dB_i
Std dB Dev of Area Means... .4 dB

UNIT TESTED ..'03 CHEVROLET
Mfg./Model ..TRAIL BLAZER
Antenna Type TRI-BAND IRRRA
Comments..... WITH LUGGAGE CARRIER

RF DETECTOR...SPECTRUM ANALYZER
Resolution BW . 100 KHz

RF SOURCE.....LAB SIGNAL
Transmit Ant. JEF 50-1000 MHz XLP
Height.....10 Ft.

Mean of Ind. MM Ratios... 17.7 dB
Std dB Dev of M/M Ratios... 5.1 dB
Mean of Ind Std dB Dev's... 3.3 dB

ID Number.....
Ant. Location...PASSENGER SIDE ROOF RACK

Mfg./Model.....Anritsu MS2601A
Detector Fn....Peak

Mfg./Model.....Anritsu MH580A1
Polarization...VERTICAL
Range.....150 Ft.

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DATE: .08-27-2002

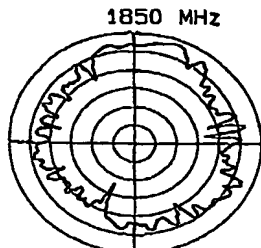
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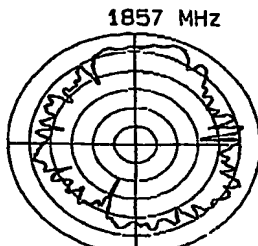
REF = 10dBi

FRONT=0

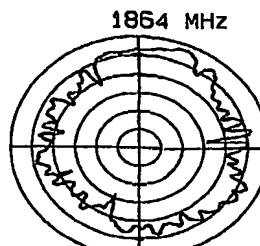
10 dB/DIV



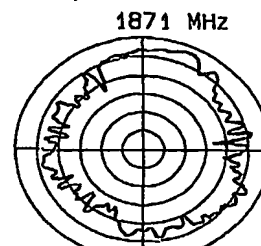
Area Mean = -.9
Std dB Dev = 6.2
M/M Ratio = 33.8



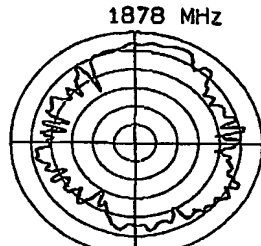
Area Mean = -1.3
Std dB Dev = 6.3
M/M Ratio = 37.3



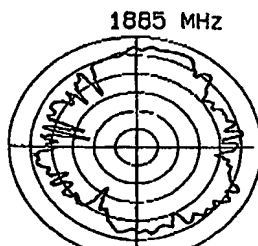
Area Mean = -1.2
Std dB Dev = 6.1
M/M Ratio = 29



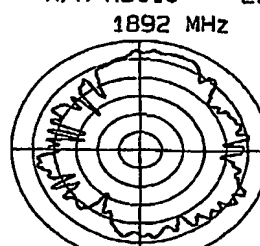
Area Mean = -1.4
Std dB Dev = 6.1
M/M Ratio = 22.9



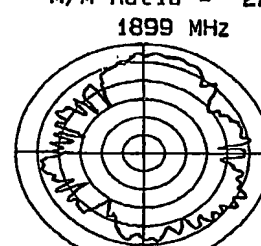
Area Mean = -1.4
Std dB Dev = 6.2
M/M Ratio = 25.8



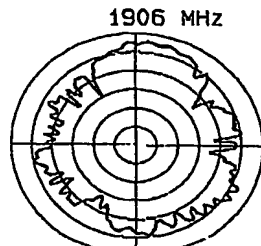
Area Mean = -1.7
Std dB Dev = 6.6
M/M Ratio = 32.8



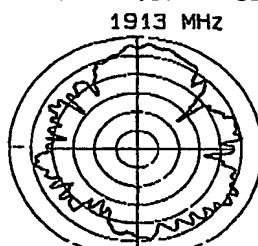
Area Mean = -1.8
Std dB Dev = 6.7
M/M Ratio = 27.6



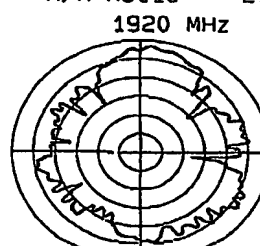
Area Mean = -1.8
Std dB Dev = 6.4
M/M Ratio = 25.8



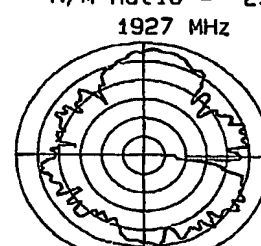
Area Mean = -1.6
Std dB Dev = 6.3
M/M Ratio = 24.8



Area Mean = -1.6
Std dB Dev = 6.5
M/M Ratio = 32.1



Area Mean = -1.4
Std dB Dev = 6.6
M/M Ratio = 33.2



Area Mean = -1.4
Std dB Dev = 6.6
M/M Ratio = 41.6

Mean of Ind. Area Means = -1.5 dBi
Std dB Dev of Area Means = .4 dB

Mean of Ind. MM Ratios = 34.3 dB
Std dB Dev of M/M Ratios = 5.1 dB
Mean of Ind Std dB Dev's = 6.4 dB

UNIT TESTED: '03 CHEVROLET
Mfg /Model: TRAIL BLAZER
Antenna Type: TRI-BAND IRR
Comments: WITH LUGGAGE CARRIER

ID Number: .
Ant Location: PASSENGER SIDE ROOF RACK

RF DETECTOR: SPECTRUM ANALYZER
Resolution BW: 100 KHz

Mfg./Model: Anritsu MS2601A
Detector Fn: Peak

RF SOURCE: LAB SIGNAL
Transmit Ant: JEF NRL 15CM HORN #1
Height: 4 Ft

Mfg./Model: Anritsu MH680A1
Polarization: VERTICAL
Range: 150 Ft.

JEF Consultant, Inc.

Belleville, Michigan

Phone: (734) 482-5505

DATE.....08-27-2002

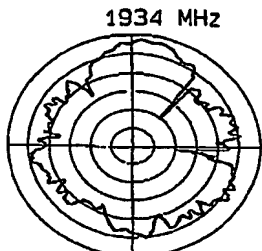
TIME. 18:58.41

PATTERN... 002

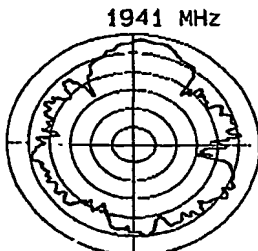
REF = 10dB_i

FRONT=0

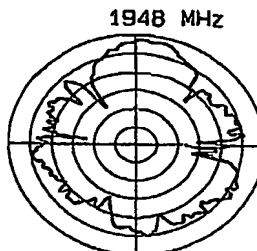
10 dB/DIV



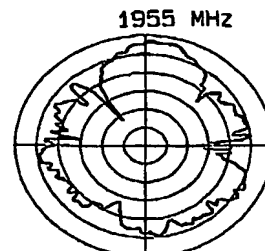
Area Mean = -1.1
Std dB Dev = 6.8
M/M Ratio = 37.9



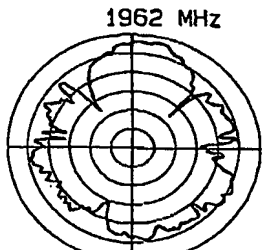
Area Mean = -1
Std dB Dev = 6.2
M/M Ratio = 25.9



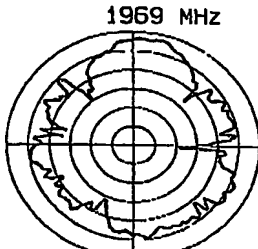
Area Mean = -1
Std dB Dev = 7.1
M/M Ratio = 33.8



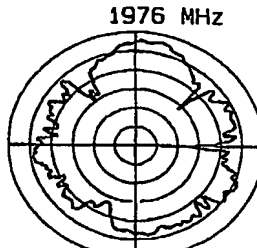
Area Mean = -1.4
Std dB Dev = 6.8
M/M Ratio = 39.2



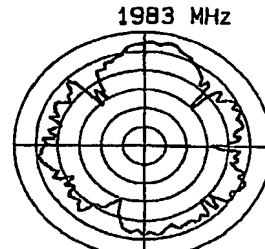
Area Mean = -1.6
Std dB Dev = 6.6
M/M Ratio = 33



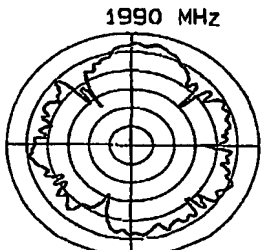
Area Mean = -1.2
Std dB Dev = 6.5
M/M Ratio = 35.9



Area Mean = -2.1
Std dB Dev = 6.1
M/M Ratio = 28.6



Area Mean = -2.3
Std dB Dev = 5.7
M/M Ratio = 26.2



Area Mean = -2.6
Std dB Dev = 5.6
M/M Ratio = 30.4

Mean of Ind. Area Means... -1.5 dB_i
Std dB Dev of Area Means... 4 dB

UNIT TESTED ... '03 CHEVROLET
Mfg./Model. ... TRAIL BLAZER
Antenna Type... TRI-BAND IIRA
Comments..... WITH LUGGAGE CARRIER

RF DETECTOR.... SPECTRUM ANALYZER
Resolution BW... 100 KHz

RF SOURCE..... LAB SIGNAL
Transmit Ant... JEF NRL 15CM HORN #1
Height..... 4 Ft.

Mean of Ind. MM Ratios.... 34.3 dB
Std dB Dev of M/M Ratios... 5.1 dB
Mean of Ind Std dB Dev's.. 6.4 dB

ID Number.....
Ant. Location... PASSENGER SIDE ROOF RACK

Mfg./Model..... Anritsu MS2601A
Detector Fn Peak

Mfg./Model..... Anritsu MH680A1
Polarization... VERTICAL
Range..... 150 Ft.

Tomatta et al
Title: INTEGRATED ROOF RACK ANTENNA
Express Mail: EV 078794949 US
Mailed: September 27, 2002
Attorney Matter No. 160-64020

50114606.092702

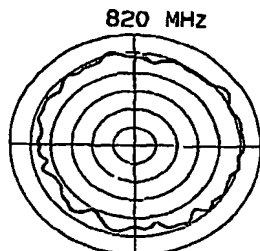
JEF Consultant, Inc.

Belleville, Michigan Phone: (734) 482-5505
DATE.... 08-27-2002 TIME.....19: 12 12 PATTERN.....004

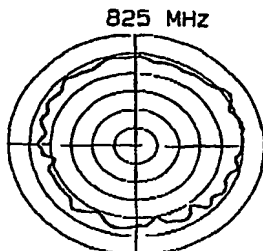
REF = 10dBi

FRONT=0

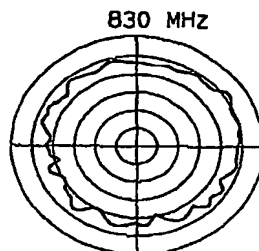
10 dB/DIV



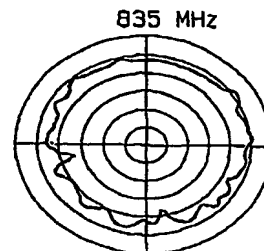
Area Mean = -1.7
Std dB Dev= 2.7
M/M Ratio = 12.7



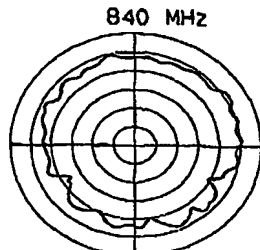
Area Mean = -3
Std dB Dev= 2.8
M/M Ratio = 13.6



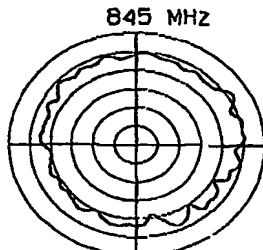
Area Mean = -3.6
Std dB Dev= 3
M/M Ratio = 14.2



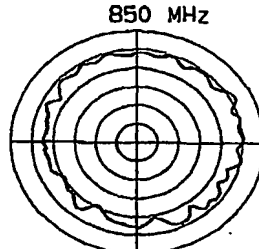
Area Mean = -3.5
Std dB Dev= 3.3
M/M Ratio = 17.7



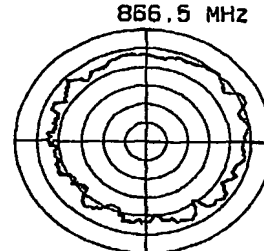
Area Mean = -3.4
Std dB Dev= 3.4
M/M Ratio = 17



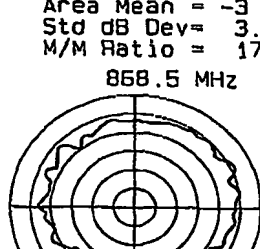
Area Mean = -3.5
Std dB Dev= 3.2
M/M Ratio = 13.9



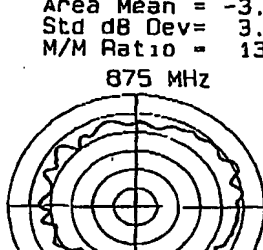
Area Mean = -3.1
Std dB Dev= 3
M/M Ratio = 13.5



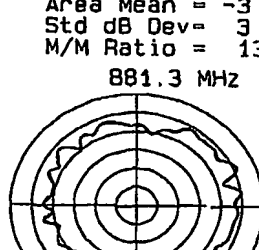
Area Mean = -4.3
Std dB Dev= 3.2
M/M Ratio = 15.3



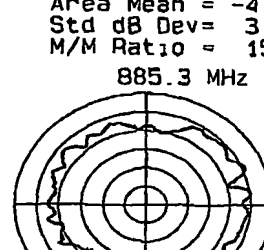
Area Mean = -4.2
Std dB Dev= 3.4
M/M Ratio = 17



Area Mean = -4.6
Std dB Dev= 3.8
M/M Ratio = 18



Area Mean = -5.1
Std dB Dev= 3.6
M/M Ratio = 14.9



Area Mean = -4.9
Std dB Dev= 3.3
M/M Ratio = 16.8

Mean of Ind. Area Means... -3.9 dB
Std dB Dev of Area Means... 4 dB

Mean of Ind. MM Ratios.... 16.1 dB
Std dB Dev of M/M Ratios... 5.1 dB
Mean of Ind Std dB Dev's... 3.3 dB

UNIT TESTED... '03 CHEVROLET
Mfg./Model... TRAIL BLAZER
Antenna Type... TRI-BAND IRRA
Comments..... LUGGAGE CARRIER REMOVED

ID Number.....
Ant. Location... PASSENGER SIDE ROOF RACK

RF DETECTOR... SPECTRUM ANALYZER
Resolution BW.. 100 KHz

Mfg./Model.... Anritsu MS2601A
Detector Fn.. Peak

RF SOURCE..... LAB SIGNAL
Transmit Ant.. JEF 50-1000 MHz XLP
Height..... 10 Ft

Mfg./Model.... Anritsu MH680A1
Polarization... VERTICAL
Range..... 150 Ft.

Tomata et al.
Title: INTEGRATED ROOF RACK ANTENNA
Express Mail: EV 078794949 US
Mailed: September 27, 2002
Attorney Matter No. 160-64020

5:51:14 686 092702

JEF Consultant, Inc.

Belleville, Michigan

Phone: (734) 482-5505

DATE.. 08-27-2002

TIME.....19:06:46

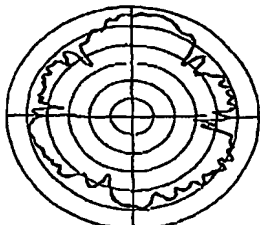
PATTERN.....003

REF = 10dBi

FRONT=0

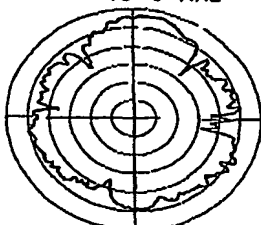
10 dB/DIV

1934 MHz



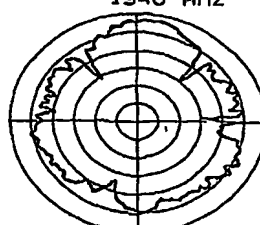
Area Mean = -.7
Std dB Dev = 5.6
M/M Ratio = 27.9

1941 MHz



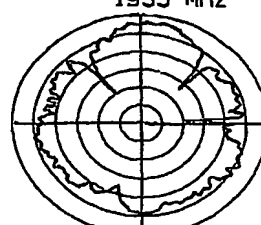
Area Mean = -.8
Std dB Dev = 5.1
M/M Ratio = 24.9

1948 MHz



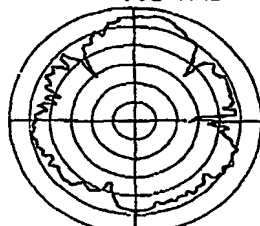
Area Mean = -.7
Std dB Dev = 5.5
M/M Ratio = 28

1955 MHz



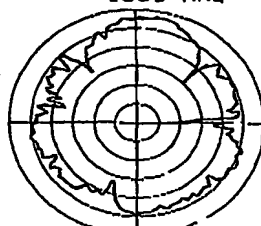
Area Mean = -1.1
Std dB Dev = 5.5
M/M Ratio = 37

1962 MHz



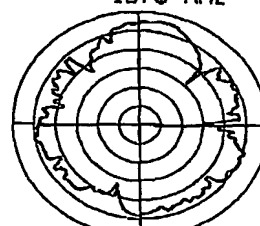
Area Mean = -1.3
Std dB Dev = 5.3
M/M Ratio = 29.1

1969 MHz



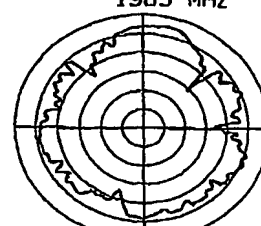
Area Mean = -.9
Std dB Dev = 5.5
M/M Ratio = 37.8

1976 MHz



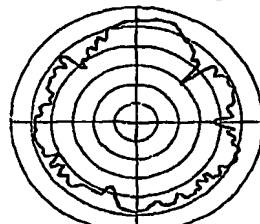
Area Mean = -1.7
Std dB Dev = 4.9
M/M Ratio = 25.6

1983 MHz



Area Mean = -1.9
Std dB Dev = 4.5
M/M Ratio = 26.3

1990 MHz



Area Mean = -2.2
Std dB Dev = 4.3
M/M Ratio = 25.6

Mean of Ind. Area Means.. -1.3 dB
Std dB Dev of Area Means.. .4 dB

UNIT TESTED....'03 CHEVROLET
Mfg./Model... TRAIL BLAZER
Antenna Type... TRI-BAND IRRRA
Comments... LUGGAGE CARRIER REMOVED

RF DETECTOR... SPECTRUM ANALYZER
Resolution BW.. 100 KHz

RF SOURCE..... LAB SIGNAL
Transmit Ant... JEF NRL 15CM HORN #1
Height..... 4 Ft.

Mean of Ind. MM Ratios ... 31.2 dB
Std dB Dev of M/M Ratios ... 5.1 dB
Mean of Ind Std dB Dev's.. 5.5 dB

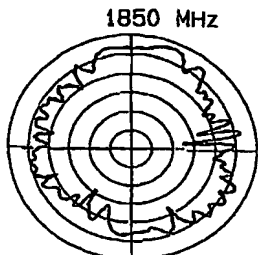
ID Number.....
Ant. Location.. PASSENGER SIDE ROOF RACK

Mfg./Model.... Anritsu MS2601A
Detector Fn.. Peak

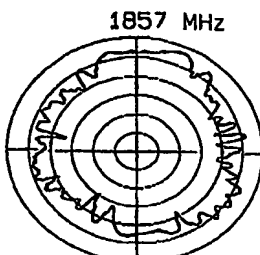
Mfg./Model.... Anritsu MH680A1
Polarization... VERTICAL
Range..... 150 Ft.

JEF Consultant, Inc.

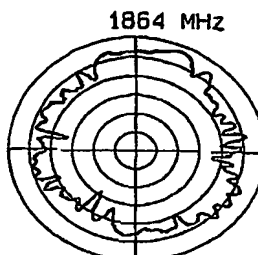
Belleville, Michigan Phone: (734) 482-5505
 DATE... 08-27-2002 TIME.....19:06.46 PATTERN.....003
 REF = 10dB₁ FRONT=0 10 dB/DIV



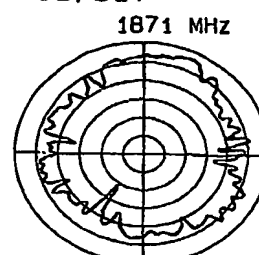
Area Mean = -.9
 Std dB Dev = 6
 M/M Ratio = 31.6



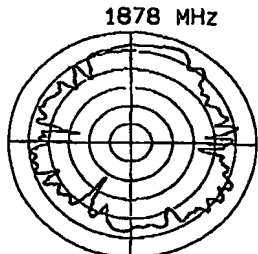
Area Mean = -1.3
 Std dB Dev = 5.8
 M/M Ratio = 27.6



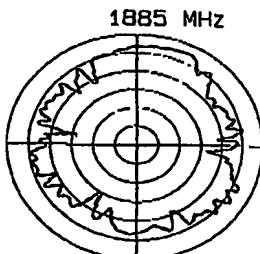
Area Mean = -1.2
 Std dB Dev = 5.7
 M/M Ratio = 29.3



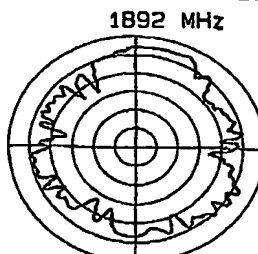
Area Mean = -1.4
 Std dB Dev = 5.9
 M/M Ratio = 35.3



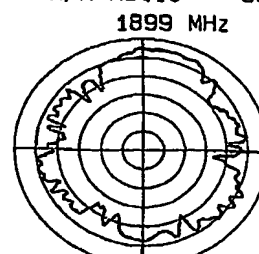
Area Mean = -1.4
 Std dB Dev = 5.9
 M/M Ratio = 33.7



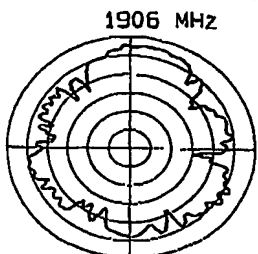
Area Mean = -1.6
 Std dB Dev = 5.5
 M/M Ratio = 27.6



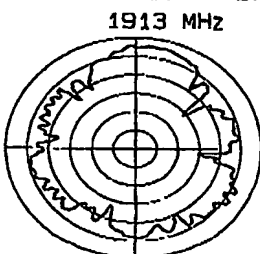
Area Mean = -1.6
 Std dB Dev = 5.5
 M/M Ratio = 22



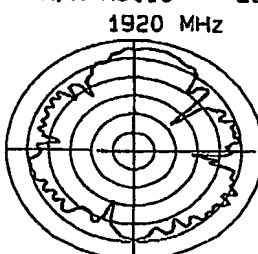
Area Mean = -1.4
 Std dB Dev = 5.4
 M/M Ratio = 21.3



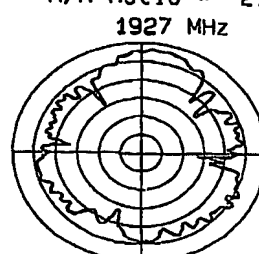
Area Mean = -1.3
 Std dB Dev = 5.5
 M/M Ratio = 25



Area Mean = -1.3
 Std dB Dev = 5.8
 M/M Ratio = 27.4



Area Mean = -1.1
 Std dB Dev = 6
 M/M Ratio = 33.3



Area Mean = -1
 Std dB Dev = 5.8
 M/M Ratio = 29.7

Mean of Ind. Area Means... -1.3 dB₁
 Std dB Dev of Area Means... .4 dB

Mean of Ind. MM Ratios... 31.2 dB
 Std dB Dev of M/M Ratios... 5.1 dB
 Mean of Ind Std dB Dev's... 5.5 dB

UNIT TESTED... '03 CHEVROLET
 Mfg./Model... TRAIL BLAZER
 Antenna Type... TRI-BAND IRRA
 Comments... LUGGAGE CARRIER REMOVED

ID Number.....
 Ant. Location... PASSENGER SIDE ROOF RACK

RF DETECTOR... SPECTRUM ANALYZER
 Resolution BW 100 KHz

Mfg./Model... Anritsu MS2601A
 Detector Fn... Peak

RF SOURCE... LAB SIGNAL
 Transmit Ant... JEF NRL 15CM HORN #1
 Height... 4 Ft.

Mfg./Model... Anritsu MH680A1
 Polarization... VERTICAL
 Range... 150 Ft.

Tomatta et al.
Title: INTEGRATED ROOF RACK ANTENNA
Express Mail: EV 078794949 US
Mailed: September 27, 2002
Attorney Matter No. 160-64020

114606 092702

JEF Consultant, Inc.

Belleville, Michigan

Phone: (734) 482-5505

DATE.....08-27-2002

TIME.....19:12:12

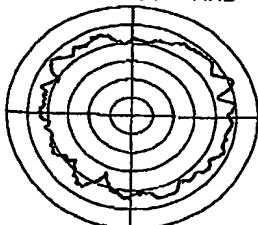
PATTERN.....004

REF = 10dBi

FRONT=0

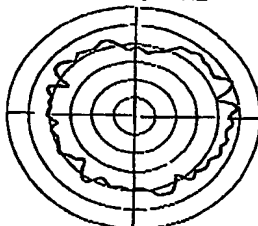
10 dB/DIV

889.4 MHz



Area Mean = -5.2
Std dB Dev = 3.2
M/M Ratio = 18.5

895 MHz



Area Mean = -7.1
Std dB Dev = 3.6
M/M Ratio = 17

Mean of Ind. Area Means...-3.9 dB
Std dB Dev of Area Means... .4 dB

UNIT TESTED... '03 CHEVROLET
Mfg./Model... TRAIL BLAZER
Antenna Type... TRI-BAND IRR
Comments... LUGGAGE CARRIER REMOVED

RF DETECTOR... SPECTRUM ANALYZER
Resolution BW... 100 KHz

RF SOURCE... LAB SIGNAL
Transmit Ant... JEF 50-1000 MHz XLP
Height... 10 Ft.

Mean of Ind. M/M Ratios... 16.1 dB
Std dB Dev of M/M Ratios... 5.1 dB
Mean of Ind Std dB Dev's... 3.3 dB

ID Number.....
Ant. Location... PASSENGER SIDE ROOF RACK

Mfg./Model... Anritsu MS2601A
Detector Fn... Peak

Mfg./Model... Anritsu MH680A1
Polarization... VERTICAL
Range... 150 Ft.